

# **S**cience and Institution-Building Efforts in Africa — The Future Role of ICIPE

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Professor Bo Bengtsson

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# **S**cience and Institution-Building Efforts in Africa — The Future Role of ICIPE

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# **Foreword**

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Over the years, the Annual Research Conference has come to be regarded as ICIPE's most important event in its annual calendar of activities. Likewise, the Annual Guest Lecture, traditionally delivered during ICIPE's Annual Research Conference has over the years, assumed unprecedented popularity and is widely regarded as the high point of presentations programmed for the conference each year.

The Theme of the 24th Annual Research Conference "Advances in Tropical Insect Science ICIPE's Accomplishments and Future Prospects" was deliberately adopted to mark ICIPE's entry into its 25th year of functional life. The Theme enabled the Centre and its collaborators to begin a process of reflection on what has been done, what has been accomplished and where it should focus its attention in the future.

In the same spirit, ICIPE invited Prof. Bo Bengtsson as its 1994 Guest Speaker because of his long association with ICIPE and its path of development. A former member and Chairman of the ICIPE Governing Council for a period of seven years (1985-1991), Prof. Bengtsson has had first-hand information on ICIPE's policies and development and is rightly regarded as one of the key people instrumental in steering ICIPE towards its path of development and success. He is internationally recognized and widely respected for the many years he has devoted to supporting and working in programmes associated with development of the Third World countries. A Swedish national, Prof. Bengtsson, has spent a greater part of his professional life working for SAREC (The Swedish Agency for Research Cooperation with Developing Countries). He spent eight years as its Director General from where he retired in 1991, and eight years prior to this as one of its Research Officers, a position he joined when SAREC was founded in 1975.

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During his tenure as Director General of SAREC, this organization grew to a highly reputable body receiving over 3 percent of the total Swedish Government allocation for development cooperation which by 1991 was about US\$ 68 million. ICIPE was privileged to be one of the beneficiaries of this fund, receiving core funding since 1976, a year after SAREC's establishment.

Prof. Bengtsson's interest in tropical agriculture, which has been the mainstay of his professional career, started in the mid-sixties in the University of West Indies in Trinidad, where he took advanced courses in tropical agriculture. Later, he worked extensively in Ethiopia in rural development projects, a programme he continued when he returned to Sweden.

Based on this very special relationship with ICIPE and using his vast experience accumulated over three decades in operations associated with agriculture and rural development of the Third World countries, Prof. Bo Bengtsson delivered a very stimulating and inspiring lecture entitled: "Science and Institution-Building Efforts in Africa — The Future Role of ICIPE."

## **Introduction**

I am pleased to be back at ICIPE. I feel honoured, having been invited to deliver the Guest Lecture at the 24th Research Conference. We all meet today with a dedication to ICIPE and its further development in both science and as an instrument in strengthening a science culture.

I am going to use this occasion to share with you some thoughts on science and development based on my own experience since the mid 1960s. As a coincidence, this period covers the life-time of ICIPE. My intention is to explore with you some features regarding Institution-building in science, its role in development and science as a possible key actor on policy. This involves not only institution-building per se. Science must be relevant to the target group: in our case the farmers and the rural population. Also, ICIPE tackles research problems of international importance. I will conclude with some remarks on the current and future development assistance.

## ***Some highlights of the early history of ICIPE***

So how did it all start? In 1967, Carl Djerassi — an organic chemist from Stanford University — addressed the Pugwash Conference on "Science and World Affairs" on the theme of research institutions in developing countries. His picture of their research and scientific manpower situation was bleak. With reference to his own personal experience from Mexico, he underlined the role of international cooperation that had benefitted steroid chemistry research in the 1950s. It led to the strengthening of Mexican research capabilities, both with manpower and scientific productivity. His address was published in the *Bulletin of the Atomic Scientists* in January 1968.

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At about the same time, Thomas Odhiambo, then a senior lecturer at the University College in Nairobi had been reflecting on science in East Africa. He was preparing an article—which appeared in *Science* in November 1969. I quote from Odhiambo's text: "It seems to me that Africa's best long-term solution to the problems of conducting effective research is to concentrate the research effort on a few very large centres". Also, he identified a need for effective science policy in Africa coupled with new approaches to science education.

Already in February 1968, Odhiambo had written a letter to Djerassi asking: "Can a move be made to develop such a centre of excellence in mid-Africa, for example in Nairobi? At the risk of appearing presumptuous, I would like to see such a centre—on insect physiology and endocrinology—established in Nairobi. Insects play a most basic role in tropical Africa: insect endocrinology is one of the newer areas in the upsurge of modern biology; and it is waiting to be exploited through interdisciplinary research. Nairobi also happens to be an ideal situation from other criteria (climate, international communications, etc.). Can you suggest how to achieve this? Would you be prepared to help launch such a scheme?"

As we all know, the response by Djerassi was positive. He had contacted Victor Rabinowitch, then Director of the US National Academy of Sciences' Board on Science and Technology for International Development. In turn, he approached the American Academy of Arts and Sciences asking them to take the lead in the United States and to explore the interest of the US scientific community and, if possible, to assist in an international effort. In Nairobi, a local organizing committee was formed to convene an international planning conference. Full support to this endeavour was given by both the Government of Kenya and the University of Nairobi. As a result, the ICIPE Foundation was organized by a number of Academies of Science, initially supported by the American Academy of Arts and

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Sciences and later through a secretariat established by the Royal Swedish Academy of Sciences.

As of April 1970, ICIPE was in operation, fully incorporated under the Companies Act of Kenya. Its first Director, Thomas Odhiambo commenced a tremendous effort in shaping his idea into reality. A Governing Council was established. In the mid 1980s, ICIPE was re-constituted into a truly International institution. These few highlights do not give justice to all energy and efforts. Time will not, however, permit me to elaborate but just praise the ICIPE Founding Director and the whole ICIPE family for their useful work.

Few people have the ability to implement a vision. Thomas Odhiambo had. Today, ICIPE is a large and well recognized institution. It is an International research institute to benefit not only Kenya but Africa as a whole. This is a great accomplishment. I want to express my admiration for the fulfillment of such a herculean task and a whole-hearted devotion to ICIPE. I am grateful having had the opportunity to work with ICIPE and wish the best for the future. Today, Thomas Odhiambo has retired, a well deserved retirement after spending most of his life at ICIPE. But ICIPE as an institution will move on. You will soon take on an important responsibility. I wish you all success in a most stimulating and challenging task.

So then, what are the new trends? What can be said from past experiences? What are the critical ingredients for a productive and sustainable institution in the future? These are among the key questions to consider to identify the future role of ICIPE in an overall changing context.

## *My perspective*

My first encounter with Africa and agricultural research dates back to the mid 1960s when I worked for the Ethiopian Ministry of Agriculture. In 1967, I spent four weeks in Kenya, visiting agricultural research institutions. The purpose was to investigate whether they could be collaborative partners with corresponding Ethiopian institutions. This was at the same time as Carl Djerassi and Thomas Odhiambo started their dialogue. Unfortunately, I did not meet Thomas Odhiambo. I was more interested in problems of the farmers rather than those of universities. However, I made observations similar to those made by Thomas Odhiambo at that time.

Again I quote him on science in East Africa: "poor administration, inadequately trained human resources, particularly in fields related to the science-based sectors of the economy, a view of nature inconsistent with development of science, virtually no public understanding of science and the absence of a science policy related to national or regional development".

Since the late 1960s, several positive developments have taken place. On balance, however, the basic thrust of this assessment is still valid. It can even be applied to many developing countries. Having been associated with development assistance since the mid 1960s and with research support for the last 20 years, I am quite concerned about this state of affairs. Why are changes so slow? This distinguished audience is, of course, better placed to give the appropriate answers. Nonetheless, having been invited here, I will provide some thoughts on this important matter.

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## *The overall context*

There are some overall trends that are decisive for future actions relating to science-led development. Some problems are researchable. Others simply require political action. There is, however, a need for a constructive dialogue between the scientific establishment and the policy-makers. This is the environment in which research institutions — such as ICIPE — must operate. To be sustainable, attract attention — and donor funds — research centres cannot confine their role to a mere addition of interesting scientific knowledge. They must be seen as key actors that contribute to solving important development problems. This calls for strategic choices. Some overall trends include:

1. Globally, enough food is available today. If evenly distributed nobody should be hungry. Still, we know that 700 million people do not have access to sufficient food to meet their needs for a healthy and productive life. Availability of daily food energy per capita in the developing countries as a whole increased by 0.7 percent per year during the 1980s. In 75 of these countries less food was produced per person at the end of the 1980s than at the beginning. Three - fourths of the African countries fell into this category. Future food production must be based on increased productivity with sustainability. The latter concept requires long-term research. It offers a real challenge to ICIPE — and other research centres. For long, ICIPE has been advocating this avenue by focusing on alternatives to chemical control of insects. What can now be put into use and what are the next steps, keeping in mind that research initiated today will take some 8-10 years to yield results? If so, what then are the critical problems to deal with?

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2. The growth of the world population is of concern. This is, of course, associated both with access to natural resources, affluent lifestyles for a minority and poverty for an increasing number of people. Over 1 billion people are living in poverty. Even if it is most widespread in Asia — amounting to 50 percent — the numbers of the poor in sub-Saharan Africa are expected to increase by almost 50 percent to 265 million in the year 2000. It will happen in just six years. This would mean one third of the developing world's poor compared to the current 16 percent. This is of some importance to ICIPE research but primarily an issue for political actions and overall social and economic development. What can science contribute in such a short time perspective?

3. The current trend of urbanization will continue. More "mega cities" will emerge in the developing world. The existing ones will continue to expand. It seems as if the limits of large cities are not yet known. Migration has also an international dimension. A serious loss is the drain of Africa's highest educated, most skilled and most enterprising people. With this perspective, they may continue to search for new opportunities outside Africa. Again, this trend is not of direct concern to ICIPE's research. But ICIPE can continue to play a role in avoiding brain drain by providing constructive ideas and approaches through research collaborative arrangements with African national institutions.

4. The end of the East-West conflict with a shift in aid flows from the South to the East. With more wisdom of the ruling powers, governments might now reduce their expenditures on military defence. Since 1960, the developed countries have doubled their spending on defence. The developing countries, however, increased their spending on military defence more than sixfold. The current affairs of war situations in many parts of the globe are disappointing. Of 37 African countries for which data is available, only 10 spend more on agriculture today than on the military. This is a strange way to achieve meaningful security.

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With such investments to development, today's situation would have been much more positive. For many more years, agriculture, forestry and the sustainable use of natural resources will turn out to be a crucial area for improvement in a future global context.

5. The effects of the HIV/AIDS epidemic are not yet known. Obviously, they will increase expenditures on both public health and food production. Although this is a global concern, it may be a specific African problem. Data from one African country indicate that the macro-economic consequences of the epidemic mean that the Gross Domestic Product (GDP) will be 15–25 percent smaller by 2010 than it would have been in the absence of AIDS. Similarly, the per capita GDP will be up to 10 percent smaller.

6. Agriculture will be more globalized and trade patterns will change as a result of the recently concluded Uruguay Rounds. According to OECD and World Bank data, the projected gains of the negotiations seem to be mainly for the OECD countries: a gain of some 140 billion US dollars. In contrast, the loser seems to be Africa (minus Libya and Egypt); the loss estimated to 2.6 billion dollars. With such an outcome one may wonder what substance there will be in the future political dialogue between the North and the South. Will Africa be of less concern to the European Community in years to come. If so, what actions are foreseen to avoid this and what can science offer?

7. Agricultural research will be more privatized. Recently, government allocations to agricultural research in developing countries have stagnated. This is in contrast to the period between 1959 and 1980 when public expenditures on agricultural research rose by sixfold in Latin America and Asia and by over fourfold in Africa. Is one of the reasons that the research set-up has not been able to deliver useful outputs as a result of investments already made?

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During the last 15 years, yield increases were the major source (80 percent) of food production growth in developing regions, except for Africa. In China, rice yields have tripled from 2 to 6 tons per hectare between 1961 and 1991. In Africa, more than half of the increased cereal production came from area expansion during the 1980s.

8. The crisis of development assistance. Aid to developing country agriculture is reported to have declined from US\$ 12 billion in 1980 to US\$ 10 billion in 1990 (in constant 1985 US dollars). Agriculture's share of total development fell from 20 to 14 percent during this period. Donors started to give priority to macro-economic reforms rather than to rural and agricultural programmes. Secondly, the rise in Third World debts in the 1980s contributed to the shift to structural adjustment and policy-based lending. This reduced the power of agricultural ministries in low-income countries. Government officials in the Third World have also turned away from low revenue agriculture, partly as a result of declining international commodity prices. In the donor countries, bureaucratic forces have affected external assistance due to reductions in the number of agricultural specialists and re-organizational steps which may have shifted power from functional units, such as agriculture, to regional bureaus headed by generalists.

### ***Africa's three P's: Potential, problems and pessimism***

Too often we speak only about Africa's problems and get very pessimistic over the current status of affairs. Still, it is necessary to stress another "P", namely, its potential. Africa retains some 100 million hectares of unutilized land suitable for cultivation, some 700 million hectares of pasture land and the highest arable land area per capita. Africa has the largest reserves of gold, diamonds and chrome. It is among the top ten producers of

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copper, aluminium, nickel, tin and mercury. Also, Africa holds 25 percent of the globe's hydro-electrical potential. Nearly 80 percent of its commercial energy of gas and oil production is exported mainly outside the continent. Why cannot this potential be better utilized to benefit the people?

For this audience there is no need to dwell too long on the problems. Let me simply focus on a few conspicuous trends:

- the 1993 report by the UN Commission for Africa shows that economic growth has steadily declined during the last three decades. In 1990, the average annual per capita income in the sub-Saharan countries was about US\$ 350. This is a dollar a day. In fact, this equals the situation in 1965;
- the real per capita growth was minus 2.2 percent during 1980–1989, compared with plus 8.7 percent in China;
- since 1970, Africa has been losing its share of world market products for agricultural commodities (2.4 percent in 1970 to 1.4 percent in 1990). The agricultural outputs has grown by less than 1.5 percent since 1970.

These facts amplify a pessimistic outlook regarding Africa's future. No doubt, Africa is lagging behind. Specific features of the African situation can easily add to a depressing mood.

- a FAO report in 1983 already stated that 3.7 million hectares of African forests were cleared per year. Deforestation outpaced tree planting by 29 to 1. Some 55 million

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Africans had serious shortages of fuelwood. Today, estimates indicate that some 6,500 ha of savanna are cleared every day;

- rural underemployment affects 40 percent of the active population. It is increasing at a rate of 4.2 percent a day;
- cereal imports are increasing, starting from almost nil in the early 1960s;
- in science education, African governments have achieved enrolment figures of some 70 percent for primary education, 14 percent for secondary but only 1.8 percent in higher education.

### ***Science and institution-building in Africa***

Generally speaking, science and technology have played a great role towards "a western-type modernization". Today, the globe is on the threshold of a new technological age with advances in biotechnology, information technologies, microelectronics and material sciences. Science will remain a key actor.

What role would it play in Africa and what would be realistic to expect from international research centres such as ICIPE? Now, it has an annual budget equivalent to the price of 2.5 tanks, (M-1 Abrams in 1993 US dollars). Although my purpose is not to conduct an impact assessment, one may put past investments to ICIPE in a context of expenditures on military equipment. Between 1970 and 1993, the donor community has spent US\$ 136 million in cash to ICIPE. In addition, the host country has generously provided in kind contributions

such as land. This means — in military terms — a total value equivalent to three fighter aircrafts (F-15). This is a rather marginal investment.

### *1. Science in a political framework*

The mismanagement of the macro-economic framework and the absence of an appropriate poverty-reducing growth strategy can probably rank as a major drawback in an African context. From 1970 to 1985 the agricultural growth diminished, averaging only 1.4 percent which is half the rate of population growth. This was mainly a result of public policies, keeping farm prices low and encouraging an urban bias. Institutionally, about 90 percent of national recurrent budgets go to wages and personnel costs with little left for operating costs. This applies also to research institutions. Furthermore, there has been little growth in trained technical and managerial staff in agriculture. In fact, the current state of affairs are to a large extent quite similar to the situation in the late 1960s.

In his book, *Earth in the Balance*, Vice-President Al Gore states that "it is increasingly difficult to avoid the conclusion that our political system is itself in deep crisis". Nobody cares about strategic issues and the future environment. Instead, it seems that we all say: "Get it while you can, forget about the future". Though he speaks about the US political system, this problem seems to be universal. A neglect of maintaining productive natural resources is in contrast to a traditional view held by farming people. Tilling the soil for survival, they have always been dependent on its long-term fertility. In my childhood — which is not too long ago — there was a well accepted principle and saying among Swedish farmers: "You should always pass on the land and farm to the next generation in such a condition that the fertility of the soil had improved." Since long, this view has

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disappeared. Short-term exploitation has been the key word. I am confident that we collectively can learn quite a lot about the actual meaning of today's catchword "sustainability" from local, traditional knowledge among many farmers, in particular in Africa. The issue is now how to treat such a concept in scientifically accepted terms. This is a great challenge to the scientific community.

We focus attention on using the technology processes to meet our immediate needs and we numb the ability to feel our connections to the natural world. In fact, we treat biology without a proper understanding and sustainable use of our natural resources. Again, the scientific establishment, including ICIPE, has a great role to play. It ought to promote a dialogue with — and influence — the policy-makers. We need much more visionary and strategic thinking at both the national and international levels. Even, individual scientists must feel a responsibility to take part in such a dialogue in addition to their research work.

Evidently, there is a difference between scientific uncertainty and political uncertainty. Science thrives on uncertainty but politics is often paralyzed. This has not been accounted for in the dialogue between scientists and policy-makers. In general, we are slow to act before the full crisis is here. We are not unlike the laboratory frog. Dropped into a pot of boiling water, it quickly jumps out. But, when placed in the luke-warm water that is slowly heated, the frog will remain there until it is rescued. Today, it seems to me, the water is quite hot.

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## *2. Science as a tool for development*

Over the last 25 years, despite the addition of more than 1.8 billion people to the world's population, global per capita food supplies have risen. Partly, this is a result of investments to agricultural research and development. Future growth must come from yield, increasing technologies and a sustainable management of the natural resources. Here are the new challenges for science for development: how to get both production, productivity and sustainability? Science must be active in problem-solving. It cannot confine its task to simply expanding the knowledge base. It means that a centre, such as ICIPE, should conduct its insect-related research on relevant development problems of highest priority, maintaining scientific excellence.

We have also to address more fundamental questions: Who are we and what's the purpose? Looking back a little at our ways of expressing our times it seems as if we only know what we are not. We speak about post-industrial economy, post-modern architecture, post-Cold-War geopolitics. We seem to adapt. But where is a future vision for a nation or a continent? What lifestyle would be most appropriate? A "western" feature of "modernization" is not sustainable — and we know it. As the Pope has said: "Modern society will find no solution to the ecological problems unless it takes a serious look at its lifestyle." Nonetheless, we all tend to behave in line with the Swahili proverb saying — in an English translation: "He who has tasted honey will return to the honey-pot." This applies in particular to the North. Again here is another great challenge for the global scientific community.

### *3. Defining relevant research problems*

The role of scientists and scientific institutions can continue to be important. In Kenya, the need for science was realized long ago by Lord Delamere. In 1909, he began privately — after two outbreaks of rust on his wheat — to cross local wheat varieties with those imported from New South Wales. Elspeth Huxley wrote in 1935: "He had realised from the first that science was ultimately the farmer's only weapon in his struggle with the African continent. In the duel between man and nature Africa thrusts with diseases, parasites and fevers, the farmer must parry with biology" This notion is still valid.

An important conclusion from this is to learn how to set research priorities right and solve the most burning problems first. This requires a good understanding of current practices by farmers and tapping their knowledge, being close to the environment. Research results emerging from such a process will most likely benefit the farmers, increase their produce and income. We have to learn more from existing knowledge and avoid duplication of research efforts by simply repeating an experiment in a new environment. The 14th Dalai Lama has said that "the destruction of natural resources results from ignorance, greed and lack of respect for the Earth's living things. It is not difficult to forgive destruction in the past which resulted from ignorance. Today, however, we have access to more information and it is essential that we re-examine ethically what we have inherited, what we are responsible for and what we will pass on to coming generations."

The harsh situation in most of Africa — together with scarce financial resources — will not allow us to invest into pure science for its own sake and just publish the results in well-respected international referred journals. Achievements in science for development must be

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visible to policy-makers and ordinary people. The requirements are not only scientific results but also practical outputs to benefit the people and society. If so, we may convince policy-makers to invest public funds into more research, including research training. As regards ICIPE, I see several options for the future:

- to continue — as now — with a mix of research efforts on crops, livestock and health;
- to focus on only one — or possibly two — of the current problem areas with mission-oriented research;
- to develop into a biological crop (plant?) protection research institution since this area is not covered by the work of the international research centres of the Consultative Group on International Agricultural Research (CGIAR);
- to concentrate on more basic research in insect sciences.

I will refrain from indicating more options but only stress that there could be interesting work and important choices to be made in the future.

#### *4. Science culture and science education*

There is certainly a need for developing a science constituency and a science culture. Generally speaking, science has not always been given a logical role in spearheading national development. This is a problem for many developing countries. It requires room for innovative individuals. The administrative rules, the bureaucratic set-up and the administrators have often been too powerful. Why the creativity of scientists has been hampered. For too many African scientists there was another outlet: they left their country

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seeking greener pastures elsewhere. This has not been a conducive element for a science culture, nor for scientific productivity.

Unfortunately, the truth dealt with by science is only a specialized or factional truth. Pure science knows only the facts of the physical world but does not know the nature of the human being. In a way, science seeks to know the truth of things outside the human being. It is important for the mind to have an understanding of a situation at the intellectual level but also an emotional feeling, an appreciation, an ability to see nature as a friend to win instead of an enemy to conquer. Scientific knowledge only is not enough to change people's ways because of attachment to habits, personal gains, social preferences and so on. So far, science does not seem to have had a significantly beneficial effect on lifestyles and mental well-being. In fact, science itself is not of much interest to common people.

Usually, scientists are looking for a general principle. But any principle arrived at is a "sub-principle", only a piece of the overall picture. Technology alone cannot answer mankind's fundamental questions. This was stated quite nicely by Max Planck, the nobel prize winner in physics in 1918. "Science cannot solve the mystery of nature. And that is because, in the last analysis we ourselves are part of nature and therefore, part of the mystery that we are trying to solve".

Buddhism for instance, believes that human beings are the highest evolution of nature. They are given a central position in the sense of recognizing their responsibilities. Maybe we ought to fully consider a warning by a Buddhist monk, Dr. Payutto. Recently, he stated that "If science does not broaden its outlook, it will arrive at a dead end. Without ethics,

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technological progress, even the beneficial kind, tends to increase the propensity for destruction. The more science and technology advance, the more keenly does destruction seem to threaten mankind; the more they are developed, the more is ethics necessitated and the more will the stability and well-being of humanity be dependent on it".

### *5. The future of development assistance to African science for development*

Starting in 1985, the amount of hard currency flowing out of the developing nations to the nations of the developed world was larger than all funds flowing in the opposite direction. This is like a blood transfusion from the sick to the healthy. With this kind of "aid" it is time to seriously question whether it is (a) logical and (b) useful to the beneficiaries.

An annual US\$ 4 billion a year — which is 7 dollars per person — on technical assistance in sub-Saharan Africa will not suffice. Not even a doubling of this. There is need for more effectiveness, national capacity building and much more local responsibility. Today, many argue that trade — not aid — will be the solution. I would caution in the light of history. When David Livingstone died in 1873, it led to a call for a worldwide crusade to open up Africa. As a remedy against a new slave trade by the Swahili and Arabs in East Africa, Livingstone's answer was the three Cs. One C was Commerce to liberate Africa. The results do not seem too impressive.

It seems urgent for Africa to find its own pragmatic solutions for the political, social and economic problems. They cannot be solved from the outside or by outsiders. To be

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explicit, I do not think more money merely as aid is the solution. Instead, we need less influence by donors and their political priorities. The country level should be the proper unit for assessment. Action must be at the country level and vulnerable people must not be forgotten. Other lessons learnt in past aid to agriculture indicate a need for more realism, more attention to institutional demands and that a lack of national ownership undercuts any donor programme.

To me, future development assistance to scientific matters should be based exclusively on grants and not on loans. It must turn away from short-term projects — which is still a major feature — to long-term capacity building and strengthening of relevant and productive institutions. In general, I see major areas for the future development assistance confined to humanitarian and emergency aid combined with preferential trade patterns.

I am optimistic on development assistance to areas of science and technology. It ought to include long-term — which means 15–20 years — research collaboration with relevant and productive national and international research institutions. This requires that the international research centres must not be the only focal point. They must develop genuine research collaboration with the national research systems. Still, the latter need a lot of strengthening but they are now stronger in the late 1960s. Research collaboration with many partners highlight another important issue, namely intellectual property rights and the ownership of research results produced. Of course, this issue is also of great concern in a North-South perspective.

One interesting potential for partnership arrangements in Africa rests with the Special Programme for African Agricultural Research (SPAAR). Being established in 1985, it is now

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working to formulate and implement master plans for activities of applied research. They are to be financed from pooled resources through consolidated funding mechanisms. The objective is to identify and promote some 15 centres of excellence in applied research and technology in Africa. In the near future, SPAAR might offer ICIPE another realistic partnership arrangement.

## ***Concluding remarks***

In concluding, I see good prospects for good, relevant and impact-oriented science and technology. ICIPE can play a leading role, making full use of past accomplishments. For the next decade, funds are important but so are good ideas. One major challenge in future research will be natural resources management where ICIPE should be able to make a substantial input. A related field would be special efforts to produce PhD scientists with a clear orientation to and specific competence in natural resources management. If ICIPE for the next decade is allocated some US\$ 10 million per year, this would again be equivalent to only three additional fighter aircrafts, F-15. Let me end with the old Kikuyu saying: "Getiree ondo wa nderel" — "Nothing is impossible".

Thank you for your attention

May 12, 1994  
Bo Bengtsson



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